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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/568,794	11/08/2006	Michael Murphy	VEECO 3.3-082	6426

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EXAMINER	
HORNING, JOEL G	

ART UNIT	PAPER NUMBER
1712	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/568,794	MURPHY ET AL.	
	Examiner	Art Unit	
	JOEL G. HORNING	1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *18 January 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,4,6-12,14-17,19 and 21-30* is/are pending in the application.

4a) Of the above claim(s) *1,3,4,6-12,14-17 and 19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. In the response of January 28th, 2011, applicant has: amended claim 21. Claims 1, 3, 4, 6-12, 14-17, 19 and 21-30 are currently pending. Due to the restriction requirement, only **claims 21-30** are currently undergoing prosecution.

Election/Restrictions

2. This application contains **claims 1, 3, 4, 6-12, 14-17 and 19** drawn to an invention nonelected with traverse in the reply filed on May 28th, 2010. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.
3. Applicant's election with traverse of Group II, drawn to a method for treating substrates in the reply filed on May 28th, 2010 is acknowledged. The traversal is on the ground(s) that the newly amended claims share more common technical features than previously, overcoming the restriction requirement. This is not found persuasive at least because as applied the rejection below, Tobashi et al (US 2002/0009868) teaches all the features of claim 21, so there is no common technical feature that is a special technical feature.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 21-24 and 27-30** are rejected under 35 U.S.C. 102(b) as being anticipated by Tobashi (US 2002009868).

Regarding **claim 21**, as seen in figure 1 of Tobashi, in chamber **B**, a substrate support **41** is rotated about an axis by shaft **5**, while supporting substrate **A** so that the substrate surface is substantially perpendicular to the axis of rotation. A plurality of gas streams is introduced into said chamber, flowing substantially parallel to the axis of rotation as they are directed towards a surface of the substrate [0041]. It teaches making the velocity (momentum) of the gas so that it is substantially uniform, which is important in order to make the pressure uniform, which can improve the uniformity of the thickness and electrical properties of the deposited film. The process gas used in the gas streams is made by mixing a reactant gas with a carrier gas to dilute it to the desired concentration [0006-0007]. These gas streams are supplied to different concentric sections radial to the axis (inward portion of the substrate) **(claim 22)**[0028] and it teaches gradually varying the concentrations in those radial sections further from the axis (the radially outward sections) have a higher reactant concentration than those closer to the axis (radially inward sections) **(claim 21)**[0018].

5. Regarding **claim 23**, the mechanism that adjusts the concentrations of the process gases (e.g. **8** and **9**) is positioned before the carrier and reactant gases exit the inlets [0042] and, as discussed above, the different inlets have different concentrations.

6. Regarding **claim 24**, Tobashi teaches depositing epitaxial films from the reactant gas using their process [0011].

7. Regarding **claim 27**, as stated previously, the concentration of the mixed gradually increases as a function of radial distance (cited as [0018]), so it is considered "substantially proportional." Additionally, as shown in figure 1, along a radius, there are only two inlets. This means that there are only two different process gas concentrations. Any two points can be approximated by a line, that is as a function with a constant proportion perfectly fitting them. This too could be considered "substantially proportional" and so is interpreted to meet the claim limitation.

8. Regarding **claim 28**, as shown in figure 1, the gases flow parallel to the axis into the concentration adjusting region **8** or **9**, where the reactants are mixed with the carrier gas to the desired concentration before they are flowed to the substrate. Mixing will necessarily occur in this region once the carrier gas and reactant gas are no longer physically separated (that is they will mix just after they are discharged from the inlets, because the end of the inlet is reasonably defined to be where the gases are no longer entering but are in the mixing zone). As discussed previously the resulting concentration in these regions is adjusted to be different from each other. Thus all the limitations are fairly taught by Tobashi.

9. Regarding **claim 29**, as seen in figure 1, Tobashi further teaches having a porous injection plate **3** between the inlets and the substrate support, so that the mixed gas streams exit from the downward facing side of the injection plate [0004].

10. Regarding **claim 30**, Tobashi wants the surface to have a uniform layer thickness (abstract). It is readily apparent that a region of the surface layer grows by the amount that the surface region receives. In order to produce, during the time of deposition, a uniform thickness layer over the entire substrate, the layer must have been growing at the same rate over the entire substrate. Thus if the surface is growing at a uniform rate over its entirety (e.g. $1g/(cm^2s)$), it is receiving substantially the same amount of reactant per unit area per unit time and the process meets the claim limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tobashi (US 2002009868), as applied previously, in view of Fujii (US 4980204).

As discussed previously, Tobashi teaches using reactant gases in their CVD process, but it does not specifically teach using an alkyl reactant. However, Fujii is also directed towards depositing CVD films using a vertical rotary reactor with a reactant and a diluent (carrier) gas. It teaches using organic reactants as the precursors for the film (col 1, lines 7-37), including specifically metal alkyl precursors like trimethyl indium (col 1, lines 66-67).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use an metal alkyl compound as the reactant gas, since such compounds were known to be suitable reactant gases for such CVD reactors and would produce predictable results **(claim 25)**.

12. **Claim 26** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tobashi (US 2002009868), as applied previously, in view of Ruehrwein (US 4010045).

As discussed previously, Tobashi teaches using a carrier gas with its reactant gas, but does not exemplify using nitrogen as that gas. The only example given is using hydrogen gas [0006]. Ruehrwein is also directed towards depositing epitaxial layers using CVD methods where the reactant gas is mixed with a carrier gas (abstract). However, Ruehrwein further teaches that hydrogen is commonly used as a carrier gas in such CVD processes, but that it produces several handling and safety problems because it is highly reactive. In order to avoid these problems, Ruehrwein teaches using inert or non-reactive gases as the carrier gas, including nitrogen gas (col 1, lines 32-55).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use nitrogen gas as a carrier gas in the general process described by Tobashi in order to avoid safety and handling problems that results from using hydrogen as a carrier gas, and furthermore since it was generally known to be desirable for use as a carrier gas in such CVD processes and would produce predictable results **(claim 26)**.

Response to Arguments

13. Applicant's arguments filed January 19th, 2011 have been fully considered and they are persuasive as directed to the 112 rejection, but unpersuasive regarding the other arguments.

14. The 112 2nd indefiniteness rejection of claim 27 is withdrawn for essentially the same reasons presented in applicant's argument. According to 2173.05(d), '[t]he term "substantially" is often used in conjunction with another term to describe a particular characteristic of the claimed invention. It is a broad term." Though it is a broad term, "substantially" does not appear to be indefinite in this case. The rejection of claim 27 under the previously applied prior art is maintained for the same reasons presented previously.

15. Applicant argues that Tobashi does not teach or suggest having the gas streams flow within the chamber toward the substrate surfaces with a substantially uniform velocity. However, as cited in the rejection Tobashi teaches that "it is very important to uniformalize the flow of gas in the reactor" [0007]. This is a very clear teaching of this limitation. Though applicant later argues that the velocities that Tobashi wants

to flow uniformly are simply the gas feed ports into the showerhead, where with the possibility for the showerhead to have different areas fed from these ports leads to ambiguity as to whether Tobashi would want the gas flows in the reactor to have uniform flow. In response to this, the examiner again cites "it is very important to uniformalize the flow of gas ***in the reactor***"(emphasis added) [0007]. This is not saying that the flow rates should be uniform in the showerhead or in the gas lines leading into the showerhead (with the conditions in the reactor itself being irrelevant) or in one or each zone of the showerhead, but rather that in the reactor, the flows should be uniform. Additionally, in context, this teaching of Tobashi follows a teaching that the gas flow rates are made uniform after the gas exits from the port, so that the gas velocities are uniform when they contact the substrate [0006]. The argument is not convincing.

16. Applicant also argues that Tobashi does not teach that that the radially outward flowing gases have a higher concentration of the reactant gas than the radially inward flowing gases. However, Tobashi very clearly (and unambiguously) teaches that the concentration can gradually increase as the flows become more radially outward in order to improve the uniformity of the deposition and film properties [0017-0020]. That Tobashi also recognizes that in some cases decreasing the concentration will also improve the uniformity is not a teaching away or against or ambiguous in any way, simply a recognition that in some depositions instead decreasing the concentration will improve the uniformity of the film, such as in the

case where (without this control) the radially outward portions become thick compared to the radially inward portions [0010]. The argument is not convincing.

Conclusion

17. No current claims are allowed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1712

/David Turocy/
Primary Examiner, Art Unit 1715